

# Palmer Amaranth Control in Georgia Cotton During 2019

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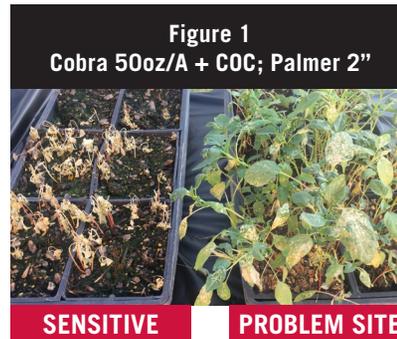
Weed control in cotton has become dynamic and complex. The greatest challenges are mitigating off-target herbicide movement and minimizing the development of more herbicide resistance. This circular is designed to assist with creating improved, economically-sound management programs, minimize cotton injury, and make on-target pesticide applications.

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**Herbicide resistance threatens our future!** Unlike ever before, herbicide resistance threatens the sustainability of our family farms. The lack of new herbicide modes of action along with the overuse of some herbicides has led to serious issues. Ryegrass and Palmer amaranth pose the greatest threats because of their competitive and genetic potentials. Herbicide-resistant Palmer amaranth has cost Georgia's cotton industry well over \$1.2 billion and the pest continues to evolve. Palmer resistance to the PPO herbicides (common PPO herbicides include Blazer, Cobra, Flexstar, Goal, Reflex, and many more) is widespread in the mid-South. Although we have not officially confirmed PPO resistance, we are greatly concerned of the potential "loss" of these herbicides. Figures 1, 2, and 3 show the response of a sensitive population ("sensitive" meaning that it is responding like it should) of Palmer to Cobra, Blazer, or Reflex applied POST at very high rates compared to the response of Palmer from a problem Georgia field.

## Steps to Improve On-target Auxin Herbicide Applications

1. Avoid applications near sensitive crops (Figures 4 and 5).
2. Apply in winds between 3-10 mph; drift can still be significant.
3. Land terrain and wind direction relative to the sprayer have huge impacts on drift.
4. Max boom height above canopy or pest is 24 inches. Drift distances can be cut in half with a 24-inch boom height compared to one at 50 inches.
5. Sprayer ground speed influences drift; stay under 10 mph. Absolutely no aerial applications!
6. No application should be made with wind toward any residential area or sensitive crop. When no sensitive crop is downwind then buffers for 1X labeled dicamba rate is 110 feet and 1X labeled 2,4-D rate is 30 feet.
7. **All applicators of Engenia, Fexapan, or XtendiMax must have a pesticide license.**
8. **Do not add AMS** to any dicamba mixture.
9. Only apply labeled formulations and tank mixtures to reduce volatility/drift potential.



**Figure 4. Visual Sensitivity Scale for Dicamba**

Lower	Moderate	Severe	Extreme
Broccoli	Cantaloupe	Cotton	Grapes*
Collards	Canola*	Pepper	Lima Bean
Cabbage	Cucumber	Tomato	Southern Pea
Kale	Peach	Watermelon	Snap Bean
Mustard	Peanut		Soybean
Pecan	Squash		Sweet potato*
Turnip			Tobacco*

**Herbicide Rate of Visually Detectable Injury**

For relative comparisons, tomato, squash, and watermelon response to Roundup for visual damage would be in the "lower" category.

\*Data from literature; all other data generated in over 70 UGA field experiments

**Figure 5. Visual Sensitivity Scale for 2,4-DD**

Lower	Moderate	Severe	Extreme
Broccoli	Cantaloupe	Pepper	Cotton
Collards	Canola	Tomato	Grapes*
Cabbage	Cucumber	Watermelon	Lima Bean
Kale	Soybean		Southern Pea
Mustard	Squash		Snap Bean
Onions			Sweet potato*
Peach			Tobacco*
Peanut			
Pecan			
Turnip			

**Herbicide Rate of Visually Detectable Injury**

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Review websites for approved spray tips, adjuvants, tank mixtures, etc.

**Enlist Duo or Enlist One**  
[www.EnlistTankMix.com](http://www.EnlistTankMix.com)

**Engenia**  
[www.engeniatankmix.com](http://www.engeniatankmix.com)

**XtendiMax**  
[www.xtendimaxapplicationrequirements.com](http://www.xtendimaxapplicationrequirements.com)

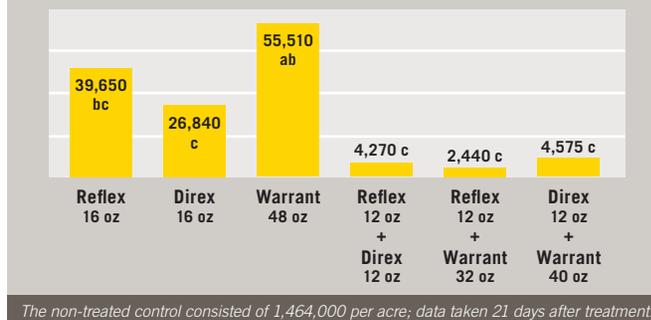
## STEP 1: BURNDOWN: Palmer amaranth must not be emerged when planting, regardless of the cotton cultivar planted.

Standard programs using Valor (before Palmer emergence), Direx, and Gramoxone + Direx are advised. Dicamba or 2,4-D would be beneficial for primrose, horseweed, and radish (2,4-D is much more effective on radish). All weeds and cover crops with the exception of cereal grains should be killed > 10 d before planting. No plant back interval exists for XtendiMax or Engenia in XtendFlex cotton; other cultivars may be planted 30 days after 1 inch of rainfall. No plant back interval exists for Enlist Duo or Enlist One in Enlist cotton; other cultivars may be planted 30 days after application, and 0.5 inch of irrigation between application and planting is beneficial.

## STEP 2: Preemergence (PRE) applications: Include 2 active ingredients for better control (Figure 6), less crop injury, and less herbicide resistance development.

PREs	HERBICIDE RATES ASSUME TIMELY SEQUENTIAL POST APPLICATIONS AND DIRECTED LAYBY
1) Brake + Reflex	1) <b>Brake</b> contains fluridone; 1 pt/A is an effective rate in mix with other herbicides. Fluridone requires significant rain/irrigation to become fully active.
2) Brake + Warrant	2) <b>Warrant</b> : For most soils, 32-40 oz/A is in order. Effective on most grasses, pigweeds and is essential for spiderwort.
3) Direx + Warrant	3) <b>Direx</b> : For most soils the ideal rate is 10-20 oz/A; lower rates on sands or under intense irrigation. Avoid diuron PRE if it was applied within 14 d of planting as a burndown.
4) Reflex + Direx	4) <b>Reflex</b> : For most soils, ideal rate is 10-12 oz/A when in these tank mixtures. Reflex mixtures are the most effective option for Palmer.
5) Reflex + Warrant	<i>NOTE: Add paraquat if pigweed is emerged; a jar test is strongly advised if mixing with Brake.</i>

Figure 6. Number of emerged Palmer amaranth/A



## STEP 3: Sequential POSTs are needed for many fields.

POST 1 ~15 d after PRE <sup>1</sup>	POST 2 ~ 15 d after POST 1 <sup>1</sup>	HERBICIDE RATES ASSUME TIMELY SEQUENTIAL POST APPLICATIONS AND DIRECTED LAYBY
<b>LIBERTY OR LIBERTY + ROUNDUP SYSTEMS<sup>2</sup></b>		<sup>1</sup> Day interval assumes PRE residual herbicides were ideally activated and applications are made on pigweed 3" or smaller; if pigweed is larger this interval must be shortened. <sup>2</sup> Glytol LibertyLink, XtendFlex, or Enlist Cotton Cultivars. UGA data suggests tolerance to Liberty is as follows: Glytol LibertyLink > Enlist > XtendFlex >>> Widestrike. <sup>3</sup> Mixes of Liberty + Roundup + residual are the most effective option for weed control; however, more injury occurs with 3-way mixes. Leaf shed and 25% injury has been noted. <sup>4</sup> Mix may provide less grass control than Roundup but more control than Liberty alone, especially for goosegrass. Use full rate of Roundup. Base Liberty rate on pigweed size. <sup>5</sup> Warrant may be added and will improve weed control; however, more injury occurs with three-way mixes. Leaf shed and 25% injury has been noted. Visit websites (on front) for latest information on glyphosate to use, tank mixes, adjuvants, and drift reduction agents. <sup>6</sup> Warrant or Dual Mag may be added and will improve weed control; however, more injury occurs with three-way mixes. Visit websites (on front) for latest information on tank mixtures, adjuvants, and drift reduction agents.
Liberty + Roundup + Dual Mag. or Warrant <sup>3,4</sup> or Liberty + Dual Mag or Warrant or Staple	Liberty + Dual Mag. or Warrant (No 3-way mix suggested late season)	
<b>ENGENIA OR XTENDIMAX SYSTEMS – XTENDFLEX COTTON</b>		
Engenia 12.8 oz/A or XtendiMax 22 oz/A + glyphosate <sup>5</sup>	Engenia 12.8 oz/A or XtendiMax 22 oz/A + glyphosate	
<b>ENLIST DUO OR ENLIST ONE SYSTEMS – ENLIST COTTON</b>		
Enlist Duo 4.75 pt/A or Enlist One 2 pt/A + glyphosate <sup>6</sup> or Enlist One 2 pt/A + Liberty <sup>6</sup>	Enlist Duo 4.75 pt/A or Enlist One 2 pt/A + glyphosate or Enlist One 2 pt/A + Liberty	

## STEP 4: A LAYBY OR HOODED SPRAYER IS ESSENTIAL FOR LONG-TERM SUSTAINABILITY

Direx + MSMA (best for pigweed) or Roundup + Direx (best for grasses and pigweeds) are great directed options; add Envoke to improve morning glory control.