

UGA Programs for Controlling Glyphosate-Resistant Palmer Amaranth in 2015 Cotton

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Advancement in cotton weed management by growers has been miraculous; however, an economical solution to the control of Palmer amaranth is still elusive. Efforts for 2015 focus on critical components of a successful management program while emphasizing factors that influence excessive crop injury and/or insufficient Palmer control. Additionally, detailed programs for Liberty-based (Table 1) and Roundup-based (Table 2) systems are provided.

Critical Steps For A Roundup-based System

1. No pigweed emerged at planting (Fig 1).
2. Plant seed into moist soil.
3. Apply two effective residual herbicides plus paraquat PRE.
4. Apply Roundup plus a residual within 13 d of planting; use Staple/Pyrimax as residual if resistance is not present.
5. Apply Roundup plus a residual 13 d after POST 1.
6. Apply layby about 18 d after POST 2 when Palmer < 5".
7. Activate PRE (30-48 hr) and POST (12-24 hr) residuals.
8. Palmer present at harvest often emerge within 17 d of planting, timeliness of POST 1 herbicides critical.
9. Hand-weed Palmer escapes prior to seed production.

Critical Steps For A Liberty-based System

1. No pigweed emerged at planting (Fig 1).
2. Plant seed into moist soil.
3. Apply two effective residual herbicides plus paraquat PRE.
4. Apply Liberty plus a residual when the largest pigweed is 3"; ≤ 12 d if PRE not activated and about 17 d if activated.
5. Apply Roundup plus a residual about 13 d after POST 1; if Palmer is up Liberty again at about 17 d is the better option.
6. Apply layby about 18 d after POST 2 when Palmer < 5".
7. Activate PRE (30-48 hr) and POST (12-24 hr) residuals.
8. Palmer at harvest often emerge within 17 d of planting.
9. Hand-weed Palmer escapes prior to seed production.

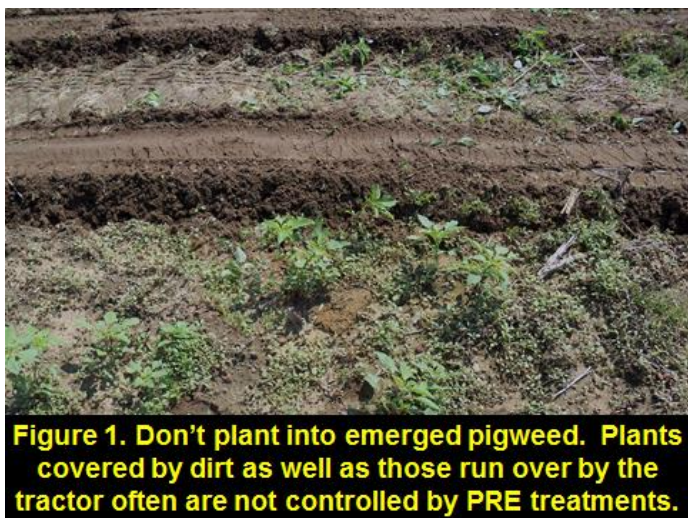


Figure 2. Palmer Control by PRE's at 21 Days

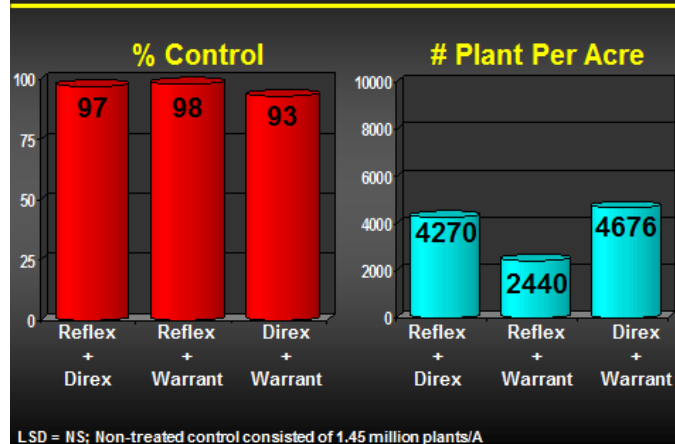


Table 1. Palmer amaranth control with ONE or TWO applications of Liberty in GlyTol/Liberty Link Cotton.¹

Preplant	Preemergence (PRE) ²	POST 1 ~17 d after PRE ³	POST 2 13-17 d after POST 1 ³	Layby ~18 d after POST 2 ³
TILLAGE OR ONE OF THESE:		ONE LIBERTY APPLICATION⁴		
Valor with glyphosate or paraquat² <i>Palmer < 1" and over 10 d before planting</i>	1. Reflex + Warrant 2. Reflex + Direx 3. Direx + Warrant	Liberty + Dual Magnum or Warrant <i>Palmer < 3"</i>	Roundup + Staple⁵ or Dual Magnum <i>Palmer < 1" with Staple; no Palmer up for Dual</i>	Direx + MSMA⁶
Valor + Direx + paraquat² <i>Palmer 1-5" and over 10 d before planting</i>	<i>Direx 10-20 oz/A; Reflex 10-12 oz/A; Warrant 40-48 oz/A</i>	-----	-----	<i>Palmer < 5"; add Envoke to improve morningglory control</i>
Direx + paraquat² <i>Palmer ≤ 5" and within 10 d of planting</i>	<i>(Use Warrant for spiderwort)</i>	Liberty + Warrant <i>Palmer < 3"</i>	Liberty + Dual Mag. <i>Palmer < 3"</i>	
		TWO LIBERTY APPLICATIONS		

¹Cotton must be tolerant to Liberty (glufosinate) herbicide. Follow all labeled herbicide use restrictions, including application rates and plant-back intervals.

²Add paraquat plus adjuvant with burndown and PRE if Palmer is emerged. If Direx (diuron) is applied burndown suggest avoid using it again PRE.

³Day interval assumes PRE residual herbicides were activated in a timely fashion; the key to this system is applying Liberty prior to Palmer reaching 3".

⁴If Palmer is not up at POST 1 but grasses are intense then switch the order of the Roundup and Liberty mixtures using Roundup mixtures at POST 1.

⁵Staple will not control ALS-resistant pigweed.

⁶Add adjuvant. Suprend + MSMA is as effective as diuron + MSMA on Palmer. Roundup mixtures are more effective if grasses are the predominant weed.

Table 2. Managing glyphosate-resistant Palmer amaranth in RR Flex cotton.¹

Prior to Planting	Preemergence (PRE) ²	POST 1 at 13 d after PRE ³	POST 2 at 13 d after POST 1 ³	Layby at 18 d after POST 2 ³
CONVENTIONAL PROGRAM 1 Reflex 12 oz/A + Prowl/Treflan <i>incorporated 1 to 2" deep</i> <i>(avoid deep incorporation; prefer within 7 d of planting)</i>	1. Reflex + Warrant 2. Reflex + Direx 3. Direx + Warrant <i>Direx 10-20 oz/A; Reflex 8-10 oz/A; Warrant 32-40 oz/A</i>	Roundup + Staple/Pyrimax <i>unless no Palmer up or ALS- resistant Palmer present; if so then apply:</i>	Roundup + Dual Magnum <i>no Palmer up</i>	Direx + MSMA ⁴ <i>Palmer < 5"; add Envoke to improve morningglory control</i>
CONVENTIONAL PROGRAM 2 Palmer-free at planting with tillage or herbicides	1. Reflex + Warrant 2. Reflex + Direx 3. Direx + Warrant <i>Direx 10-20 oz/A; Reflex 12 oz/A; Warrant 3 pt/A</i>			
CONSERVATION TILLAGE Valor with glyphosate or paraquat² <i>Palmer < 1" and over 10 d before planting</i>	1. Reflex + Warrant 2. Reflex + Direx 3. Direx + Warrant <i>Direx 10-20 oz/A; Reflex 12 oz/A; Warrant 3 pt/A</i>	Roundup + Warrant		
Valor + Direx + paraquat² <i>Palmer 1-5" and over 10 d before planting</i>				
Direx + paraquat² <i>Palmer ≤ 5" and within 10 d of planting</i>				

¹Follow all labeled herbicide use restrictions, including application rates and plant-back intervals.

²Add paraquat plus adjuvant with burndown and PRE if Palmer is emerged. If Direx (diuron) is applied burndown suggest avoid using it again PRE.

³Day interval assumes PRE residual herbicides were activated in a timely fashion.

⁴Add adjuvant. Suprend + MSMA is as effective as diuron + MSMA on Palmer. Roundup mixtures are more effective if grasses are the predominant weed.

Conditions When Herbicide Programs Fail and Potential Solutions To Avoid Failure:

1. Planting into emerged pigweed ensures failure (Fig 1): *Ideally kill pigweed prior to strip tilling or planting.*
2. PRE herbicides are not activated: *Staple/Pyrimax on non-ALS resistant Palmer < 1" or Liberty on Palmer < 3".*
3. Heavy rains occur after PRE: *The need for more residual quickly is critical as the length of residual control has been shortened; if cotton is struggling from rains, consider Dual or Warrant alone within a few days of emergence .*
4. Growers expect residual control from the PRE to last forever: *Ideal conditions at planting often result in perfect control for about 2 wks. As noted in Figure 2, excellent visual control from PRE's often lasts through 21 d but when fields consist of millions of plants per acre, 1.45 million in this study, control of 98% equals over 2400 plants per acre emerged by 21 d. POST 1 applications must be extremely timely!!!!*
5. Pigweeds are resistant to Roundup + Staple/Pyrimax POST in my field: *In the Roundup program, Dual or Warrant must be applied POST and activated prior to Palmer emerging through the PRE treatment.*
6. POST applications are late: *In a Palmer world, no management program will be effective with late applications. The UGA calendar program is developed based on the biology of Palmer amaranth to assist in timely applications.*

Minimizing Injury from PRE Herbicides: 1. Plant high vigor seed into moist soil (preplant irrigation often needed). 2. Shallow planting depth increases injury potential. 3. Apply proper residual herbicides within 24 hr of planting. 4. If feasible, irrigate between 30 hr after planting and prior to 24 hr before emergence but then do not irrigate again until at least 5 d after emergence. 5. Irrigate to develop a perfect cotton stand; however, limit irrigation events during the first 2 wks after planting to as few as possible after activating residual herbicides.

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