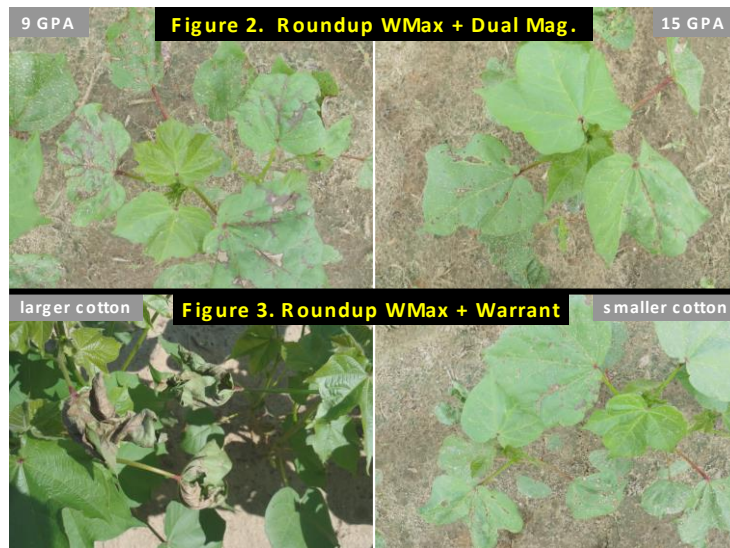
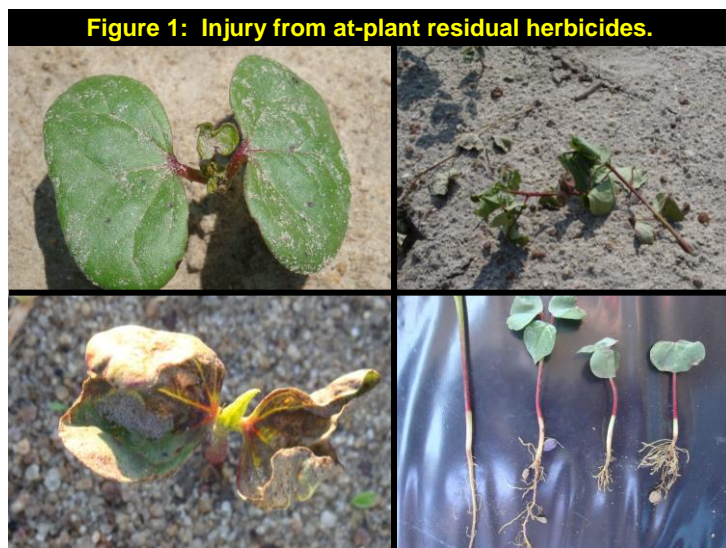


UGA Programs for Controlling Glyphosate-Resistant Palmer Amaranth in 2014 Cotton

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Improved management of glyphosate-resistant Palmer amaranth by Georgia cotton growers has been amazing. Implementing herbicide programs having diverse herbicide chemistry integrated with hand weeding, tillage and/or cover crops has proven extremely effective. Although programs are complex, it is those growers who 1) develop sound management programs, 2) implement these programs in a timely fashion, and 3) remove all Palmer amaranth escapes prior to seed production thereby managing the seedbank who now have the upper hand on the most challenging pest in agronomic crop production. For 2014, herbicide programs continue to improve (Tables 1 and 2) with research now focusing on minimizing herbicide injury and creating more economical management programs.



Minimizing injury from at-plant herbicides (Fig. 1):

1. Plant high vigor seed.
2. Shallow planting depth increases injury potential.
3. Plant into a moist soil (preplant irrigation may be needed).
4. Apply proper residual herbicides within 24 hr of planting.
5. Avoid irrigation within 30 hr of planting (36 hr if cold).
6. Avoid irrigation 24 hr before and 48 hr after emergence.
7. Irrigate to develop the perfect cotton stand; however, limit irrigation events during the first 2 wk after planting to as few as possible after activating residual herbicides.

Minimizing injury from topical herbicides:

1. Avoid heavy dew (pooling when spray) on cotton plants.
2. Avoid extreme conditions (wet, dry, cold, hot).
3. Avoid “Thripy” cotton.
4. Additional additives (other than those labeled) will increase injury without improving weed control.
5. Apply proper GPA; low GPA may increase injury (Fig 2).
6. Succulent growing cotton is more sensitive.
7. Cotton growth stage is the greatest factor influencing injury; younger cotton, 1- to 7-leaf, is often injured less than older cotton, 8- to 15-leaf (Fig 3).

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

Preplant	Preemergence (PRE) ²	POST 1 at 14-18 d after PRE ³	POST 2 at 14-18 d after POST 1 ³	Layby at 16-18 d after POST 2 ³
CONSERVATION TILLAGE		ONE LIBERTY APPLICATION⁴		
Valor with burndown <i>Palmer < 1" and over 10 d before planting</i>	1. Reflex + Warrant 2. Direx + Warrant	Liberty + Dual Magnum or Warrant⁵ <i>(Palmer ≤ 3")</i>	Roundup + Staple or Dual Magnum⁵ <i>(Palmer < 1" with Staple; no Palmer up for Dual)</i>	Direx + MSMA⁶ <i>(Palmer < 5")</i>
Valor + Direx + paraquat² <i>Palmer 1-5" and over 10 d before planting</i>	<i>Reflex: 10 to 12 oz/A;</i> <i>Warrant: 3 pt/A;</i> <i>Direx 10 to 24 oz/A</i>	----- Liberty + Warrant <i>(Palmer ≤ 3")</i>	----- Liberty + Dual Mag. <i>(Palmer ≤ 3")</i>	
Direx + paraquat² <i>Palmer ≤ 5" and within 10 d of planting</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 adjuvant with paraquat during burndown; also add paraquat + adjuvant with all preemergence applications if any pigweed is emerged.

³Use shorter time interval for POST applications if planting after May 10 and the longer interval if planting before May 10.

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.

⁵Make only one application of Dual Magnum per year and no more than two applications of Warrant per year; Staple will not control ALS-resistant pigweed.

⁶Add adjuvant. Also add Aim, Envoke, or ET if morningglory is > 3"; follow cotton size restrictions. Suprend + MSMA is as effective as diuron + MSMA.

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

Prior to Planting	Preemergence (PRE) ²	POST 1 at 13-16 d after PRE ³	POST 2 at 14-16 d after POST 1 ³	Layby at 16-18 d after POST 2 ³
CONVENTIONAL PROGRAM 1 Reflex ⁴ 12 oz/A + Prowl/Treflan incorporated 1 to 2 inches deep (prefer within 7 d of planting)	1. Reflex + Warrant 2. Reflex + Direx 3. Direx + Warrant <i>Dirx 10 to 24 oz/A; Reflex 8 to 10 oz/A; Warrant 3 pt/A</i>	Roundup + Staple or Pyrimax ⁵ (Palmer ≤ 1")	Roundup + Dual Magnum (before Palmer up)	Direx + MSMA ⁶ (Palmer < 5"; add Envoke to improve morningglory control)
CONVENTIONAL PROGRAM 2 Keep clean with tillage or herbicides as noted in conservation tillage section below	1. Reflex + Warrant 2. Reflex + Direx 3. Direx + Warrant <i>Dirx 10 to 24 oz/A; Reflex 12 oz/A; Warrant 3 pt/A</i>	Roundup + Staple or Pyrimax ⁵ (Palmer ≤ 1")	Roundup + Dual Magnum (before Palmer up)	Direx + MSMA ⁶ (Palmer < 5"; add Envoke to improve morningglory control)
CONSERVATION TILLAGE Valor with burndown <i>Palmer < 1" and over 10 d before planting</i>	1. Reflex + Warrant 2. Reflex + Direx 3. Direx + Warrant <i>Dirx 10 to 24 oz/A; Reflex 12 oz/A; Warrant 3 pt/A</i>	Roundup + Staple or Pyrimax ⁵ (Palmer ≤ 1")	Roundup + Dual Magnum (before Palmer up)	Direx + MSMA ⁶ (Palmer < 5"; add Envoke to improve morningglory control)
Valor + Direx + paraquat ² <i>Palmer 1-5" and over 10 d before planting</i>				
Direx + paraquat ² <i>Palmer ≤ 5" and within 10 d of planting</i>				

¹Follow all herbicide label use restrictions and plant back intervals.

²Add adjuvant with paraquat during burndown; also add paraquat + adjuvant with all preemergence applications if any pigweed is emerged.

³Use shorter time interval for POST applications if planting after May 10 and the longer interval if planting before May 10.

⁴The split Reflex program including preplant incorporated and PRE Reflex applications is the most effective program in cotton.

⁵Replace Staple/Pyrimax with Warrant if carryover or ALS-resistance is an issue.

⁶Add adjuvant. Suprend + MSMA is as effective as Direx + MSMA.

Improving Weed Control While Reducing Cotton Injury: Our efforts have evaluated a new management approach in which postemergence applications are based on days after planting rather than on crop or weed size. For example, in RR cotton planted on May 10, a grower plants into a clean seedbed and applies PRE herbicides; at 14 days after the PRE, the POST 1 application is made; a POST 2 application is made 15 days after the POST 1 application; and 17 days after the POST 2 treatment the layby is applied (see Tables 1-2 for intervals). *Results from 8 large on farm studies during the past two years showed this approach 1) was as effective as or more effective in controlling weeds than current grower practices and 2) less herbicide injury from topical applications was noted. Less herbicide injury was likely a result of this program making topical applications to younger cotton while grower applications were made later to larger, more sensitive cotton.* Growers are strongly encouraged to try this approach on a limited basis until confidence is gained.

PROTECT LIBERTY: YOUR ABILITY TO GROW COTTON IN THE FUTURE MAY DEPEND ON IT

1. Do not make more than 2 applications of Liberty (generic) per year.
2. Spray Liberty when the biggest pigweed in the field is 3 inches or smaller.
3. Never ever use a reduced rate but keep in mind rates do vary depending on weed size!
4. Wait 1.5 hr after sunrise to begin spraying and stop spraying at least 1.0 hr before sunset.
5. Apply at a minimum of 15 GPA using a speed, spray tip, and pressure that delivers a medium spray droplet.
6. Integrate herbicide programs with 1) hand weeding, 2) tillage, and/or 3) heavy rye cover crop residue.

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