

Controlling Glyphosate-Resistant Palmer Amaranth in 2017 Cotton with Liberty or Roundup + Liberty Programs

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Although new auxin technologies are increasing management options for cotton growers, the use of 2,4-D and dicamba must be limited in areas where sensitive crops/plants are nearby. Liberty and auxin programs are similarly effective when growers are timely. Our focus with this circular is to help growers implement sound, sustainable programs for the control of Palmer amaranth while minimizing cotton injury without the use of auxin herbicides.

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STEP 1: Palmer amaranth must not be emerged when planting, regardless of technology. Approaches to eliminate this concern follow:

CONSERVATION TILLAGE ¹	CONVENTIONAL
1) Valor ² + Roundup or Gramoxone: Palmer <1" and over 10 d before planting.	1) Reflex 12 oz/A + Prowl/Treflan incorporated 1-2" deep; within 7 d of planting.
2) Valor ² + Direx + Gramoxone: Palmer 1-5" and over 10 d before planting.	2) Tillage: pigweed larger than 3 inches often do not die.
3) Direx + Gramoxone: Palmer ≤ 5" and within 10 d of planting.	3) Herbicides: see conservation tillage section; different plant backs apply.

¹Follow labeled plant-back intervals, Gramoxone needs adjuvant, adding 2,4-D or dicamba would improve primrose, radish, and horseweed control but extends plant back.

²If planting between 10 and 28 d after applying Valor, run strip-till after spraying and before planting.

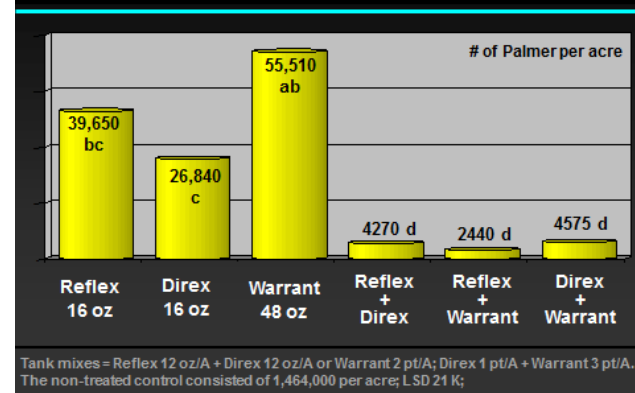
STEP 2: Apply 2 residual active ingredients PRE right after planting. Control by high rates of one product is less than that by lower rates of two (Fig 1).

PRE'S	HERBICIDE RATES	COMMENTS
1) Reflex + Warrant	1) Reflex: For most soils, ideal rate is 12 oz/A. If following Reflex preplant incorporated, use 8 oz/A.	1) Use Warrant for spiderwort.
2) Reflex + Direx	2) Warrant: Roundup system likely needs 48 oz/A except on light soil textures or under intense irrigation where 32-40 oz/A is more appropriate; Liberty + Roundup system use 32-40 oz/A.	2) Avoid diuron if applied burndown within 14 days of planting.
3) Direx + Warrant	3) Direx: For most soils the ideal rate is 10-20 oz/A; lower rates on sands or under intense irrigation.	3) Add paraquat if pigweed is emerged.
4) Brake F16	4) Brake F16 contains fomesafen and fluridone; 1 pt/A is an effective rate for most soils. Fluridone requires significant rain/irrigation to become fully active.	If mixing paraquat with Brake F16, a jar test is advised.

Minimizing Injury from PRE Herbicides:

1. Plant high vigor seed into moist soil (preplant irrigation often needed if available).
2. Shallow planting depth increases herbicide injury potential.
3. Apply proper PRE residual herbicides within 24 hr of planting.
4. If feasible, irrigate between 30 hr after planting and prior to 24 hr before emergence. Then do not irrigate again until at least 5 d after emergence. Most often, the greatest damage occurs when the first irrigation/rainfall event happens during emergence.
5. Irrigate to develop a perfect cotton stand; however, limit irrigation events during the first 2 weeks after planting to as few as possible after activating residual herbicides.

Figure 1. Number of emerged Palmer amaranth per acre 21 d after planting.



STEP 3: Regardless of cotton technology, sequential POST applications must be timely!!

LIBERTY OR LIBERTY + ROUNDUP SYSTEMS ¹		
POST 1 ~17 d after PRE ²	POST 2 ~ 13-17 d after POST 1 ²	Comments
<p><i>Biggest pigweed in field 3 inches:</i></p> <p>Liberty + Roundup + Dual Magnum or Warrant^{3,4} or Liberty + Dual Mag. or Warrant</p> <hr/> <p><i>No pigweed emerged:</i></p> <p>Roundup + Staple, Dual Mag. or Warrant</p>	<p><i>Biggest pigweed in field 3 inches:</i></p> <p>Liberty + Dual Magnum or Warrant (No 3-way mix suggested at this stage of growth)</p> <hr/> <p><i>No pigweed emerged:</i></p> <p>Roundup + Staple, Dual Mag., or Warrant</p>	<p>¹Glytol LibertyLink, XtendFlex, or Enlist Cotton Cultivars Only. UGA data suggest tolerance to Liberty is as follows: Glytol LibertyLink > Enlist > XtendFlex>>>Widestrike.</p> <p>²Day interval assumes PRE residual herbicides were ideally activated.</p> <p>³Mixes of Liberty + Roundup + residual are the most effective option for weed control; however, they cause more injury than 2-way mixes. Injury of 25% with leaf shed has been observed.</p> <p>⁴Tank mix may provide less grass control than Roundup alone but more control than Liberty alone, especially for goosegrass. Use full rate of Roundup. Base Liberty rate on pigweed size.</p>

Reducing the potential for POST herbicides to negatively impact yield:

- 1) Research suggests cotton injury near or during fruit set is more likely to be detrimental as compared to early season injury (Figure 2). Therefore, one should make all topical applications before the 8-leaf stage of cotton growth; programs above provide application intervals between PRE, POST1, and POST 2 applications to assist with this objective. After 8-leaf cotton, make sloppy directed or precision directed applications according to herbicides applied.
- 2) Research in 2015 and 2016 suggested greatest negative impact from POST herbicide applications occurred when significant injury was observed for several weeks. Thus, it is important when making sequential POST applications to minimize injury with the 2nd POST application.

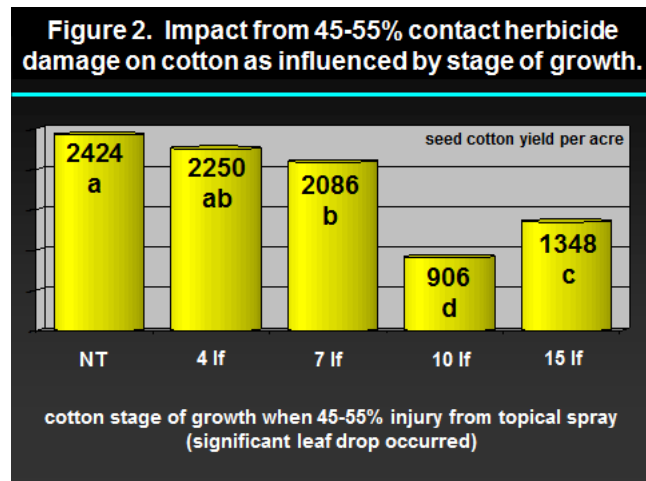
STEP 4: Directed layby herbicide applications are needed for nearly all acres.

LAYBY Options ^{1,2}	COMMENTS
1. Direx + MSMA	If soil type allows, apply 1 qt Direx + 1 qt of MSMA + 1 qt of crop oil concentrate.
2. Roundup + Direx	Direx + MSMA is far better for pigweed; however, if grasses are an issue then Roundup + Direx (1.5 pt/A) after cotton is at least 12 inches tall is in order.

¹For both layby options. *To improve morningglory control consider adding:* Envoke 0.075-0.1 oz/A. *To improve spiderwort, pigweed, and grass residual control consider adding:* 1) Dual Magnum 1 pt/A; 2) Warrant 2 pt/A; 3) Zidua 1 oz/A; or 4) Outlook 12 oz/A.

²See the pest control handbook or label for cotton stages required for applications of various herbicides.

STEP 5: Hand-weed any escaped pigweed prior to seed set.



Generic products are available for Direx, Dual Magnum, Gramoxone, Liberty, Prowl, Reflex, Staple, Treflan and Valor. *Read & follow all label requirements.*

