2021 Cotton Weed Control in Georgia. *A. S. Culpepper and J. C. Vance*

Herbicide resistance and off-target movement of pesticides threaten our family farms like never before. If farmers, scientists, and regulators do not take this concern seriously, economically effective weed management approaches will rapidly disappear. Growers must implement sound diversified management programs including cultural/mechanical tactics, and when applying pesticides take extreme caution ensuring they remain within the intended target area. ***The Georgia Cotton Commission, Cotton Incorporated, and Industry are primary funding sources!!***

STEP 1: Removing weeds before planting is essential, especially Palmer amaranth!

Cover crops, tillage, and herbicides are all potentially important components of farm sustainability. ***Cover crops*** reduce weed emergence which decreases herbicide selection pressure by lessening the number of weeds needing to be controlled. A recent study noted a 65% reduction in Palmer amaranth emergence for the year with only 4,500 lb of rolled dry matter residue (*Fig 1*). Similar responses were observed with grasses while morningglory was impacted less. ***Deep turning*** can place many weed seeds at a depth where they cannot emerge. This approach can be extremely effective on Palmer amaranth, ryegrass, and other small-seeded weeds that emerge close to the soil surface. The seed's ability to remain viable while buried should influence timing of subsequent tillage.

All weeds and cover crops, with the exception of cereal grains, should be killed at least 14 days before planting. Valor at 2 oz/A and/or Direx at 1 to 2 pt/A are needed for residual control in most fields. Dicamba or 2,4-D would be beneficial to control primrose, horseweed, fleabane, and radish (2,4-D is much more effective on radish). Gramoxone + Direx offers the most effective option for emerged Palmer amaranth while mixtures of glyphosate + 2,4-D + Valor or Direx or glyphosate + dicamba + Valor or Direx would be extremely effective for most weeds infesting Georgia fields.

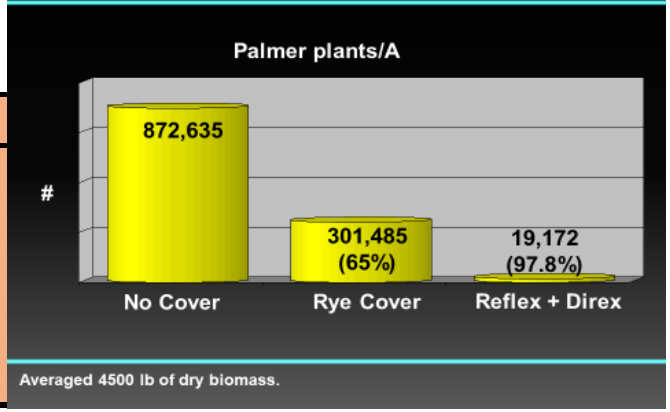
Plant-back interval for Valor, Direx, dicamba, and 2,4-D.	
Valor	**Strip-till (ripper shank) after application and before planting: 1) > 30% ground cover = 7 days; 2) 10-30% ground cover = 14 days + 0.5" rain; 3) <10% ground cover = 21 days + 1.0" rain. In no-till or when the strip is implemented prior to application = 28 days + 0.5" (>10% ground cover) or 1" (<10% ground cover) rain.**
Direx	**No-till: 10 day; strip-till (ripper shank) after application and before planting: 0 day.**
Dicamba	**No interval exists for XtendiMax/Engenia in XtendFlex cotton; other cultivars may be planted 30 d after 1" of rain. Restrictions differ on other brands.**
2,4-D	**No interval exists for Enlist Duo/Enlist One in Enlist cotton; other cultivars may be planted 30 d after application. Restrictions may differ on other brands. Avoid ester formulations if soil temps are above 80 F.**

STEP 2: Applying two residual herbicides at planting can keep you farming!

Research during 2018, 2019, and 2020 showed preemergence (PRE) herbicides, if activated, reduced the number of Palmer amaranth needing to be controlled during the ENTIRE season by nearly 98% (*Fig 1*). At-plant applications using two residual herbicides effective on Palmer amaranth are paramount in reducing resistance to topically applied herbicides like Liberty, 2,4-D choline, and dicamba.

PRE'S	HERBICIDE RATES AND COMMENTS
1) Brake + Reflex **2) Brake + Warrant** **3) Direx + Warrant** **4) Reflex + Direx** **5) Reflex + Warrant**	**1) Brake** at 1 pt/A is an effective rate in mixtures but will require significant rain/irrigation to become fully active. **2) Warrant** at 32-40 oz/A, for most soils, is in order. Effective on most grasses, pigweeds, and is essential for spiderwort. **3) Direx** at 10-16 oz/A is needed for most soils; lower rates on sands or under intense irrigation. **4) Reflex** at 10-12 oz/A is ideal for most soils when used in these mixtures; best option for Palmer. *NOTE: Add paraquat if pigweed emerged; jar test advised if mixing with Brake.*

Figure 1. Number of Palmer to kill with POST herbicides during entire season, GA and TN. 4 Locations



STEP 3: Sequential topically applied herbicide treatments are needed in most fields.

Selecting the ideal postemergence herbicide system to control weeds while minimizing cotton injury is challenging. The table below provides several suggested systems, but of course growers need to adjust programs to fit the weeds and environmental conditions present at application time.

POST 1 ~15-17 d after PRE (assuming PRE is activated)	POST 2 ~ 15-17 d after POST 1[1] (before 9-leaf cotton)
LIBERTY OR LIBERTY + ROUNDUP SYSTEMS	
Liberty + Roundup + Dual Mag., Outlook, or Warrant *or* **Liberty + Dual Mag, Outlook, Warrant, or Staple**	**Liberty + Dual Mag., Outlook, or Warrant** *(No 3-way mixture suggested late-season)*

In research, rates of residual herbicides have included Dual Mag. at 1 pt/A; Outlook at 12.8 oz/A; Warrant at 2 pt/A, and Staple at 2 oz/A. Mixtures of Liberty + Roundup + residual are often the most effective option for weed control but 25+% injury and leaf-shed has been noted. Mixing Liberty with Roundup may reduce grass control, maximize Roundup rate.

ENGENIA OR XTENDIMAX SYSTEMS – XTENDFLEX COTTON	
Engenia 12.8 oz/A or XtendiMax 22 oz/A + glyphosate *or* **Tavium 56 oz/A + glyphosate** *(cannot apply overtop after 6-leaf cotton)*	**Engenia 12.8 oz/A or XtendiMax 22 oz/A + glyphosate** *or* **Liberty + Dual Mag, Outlook, or Warrant**

Warrant (2 pt/A), Dual Mag. (1 pt/A), or Outlook (12.8 oz/A) may be added with glyphosate + Engenia or XtendiMax mixtures to improve residual weed control; however, more injury will occur. Injury with mixtures of three herbicides often can reach 25+% with leaf shed in some conditions. Visit web sites for latest information on approved tank mixtures, adjuvants and drift reduction agents for Engenia (www.engeniatankmix.com), XtendiMax (www.xtendimaxapplicationrequirements.com), and Tavium (www.TaviumTankMix.com).

ENLIST ONE SYSTEMS – ENLIST COTTON	
Enlist One 2 pt/A + Liberty *or* glyphosate	**Enlist One 2 pt/A + Liberty *or* glyphosate**

Warrant (2 pt/A) or Dual Mag. (1 pt/A) may be added with Enlist One + Liberty or glyphosate for improved residual control; however, injury with mixtures of three herbicides often reach 25+% with leaf shed in some conditions. If making only one Liberty + Enlist One application in the system, apply it first if all pigweed can be controlled; otherwise, apply it second. Visit web site for latest information on approved tank mixtures, adjuvants and drift reduction agents for Enlist One (www.enlisttankmix.com).

STEP 4: Layby directed or hooded applications

IMPORTANT: Complaints about morningglory, spiderwort, and grass escapes in cotton have risen drastically. This result is primarily a response to making the last herbicide application overtop of the cotton where the spray covers the crop but does not effectively contact emerged weeds or the soil for residual control. Layby applications will improve spray coverage of emerged weeds and the soil resulting in better control (*Fig 2*). Direx + MSMA (best for pigweed) or Roundup + Direx (best for grasses, 2nd best on pigweeds) are effective options. Add Envoke to improve morningglory control. For spiderwort, add Dual Mag, Outlook, or Warrant. Valor, Caparol, and Cotoran are also useful tools to be considered in a directed system.